AbstractID: 3676 Title: Temporal Radiographic Texture Analysis for the Detection of Periprosthetic Osteolysis

Purpose:
We have been investigating temporal radiographic texture analysis (RTA) as a method to help detect the disease periprosthetic osteolysis associated with total hip arthroplasties. This disease is a common but difficult to detect long-term complication for total hip replacement patients. It typically goes unnoticed on radiographs until at least seven years after the operation. The goal of our research is to assess the ability of temporal RTA to detect osteolysis before it is visible radiographically.

Method and Materials:
We obtained digitized pelvis radiographs from 84 total hip replacement cases from the Anderson Orthopaedic Research Institute. Each case included a baseline image taken shortly after surgery and follow-up images taken at various time intervals. The cases were assessed for osteolysis by an orthopaedic surgeon and regions of interest (ROIs) were selected within the osteolytic region (or a comparable region for normal cases) on the final image of each case. These ROIs were then visually matched on all previous images. Fourier-based, fractal-based and correlation-based features were calculated for each ROI. To measure temporal trends in feature values, we calculated the slope of the least squares fitted line for each case using data through five year and nine year time ranges, respectively. Temporal feature performance was examined using Receiver Operating Characteristic (ROC) analysis.

Results:
Forty-four cases were determined to have osteolysis while forty were normal. A_z values from ROC curves ranged from 0.6 to 0.75 for the task of distinguishing between osteolysis and normal cases for both time ranges.

Conclusion:
Temporal RTA appears to have the potential to help detect periprosthetic osteolysis before visual radiographic appearance of the disease. More development of temporal RTA and analysis with a larger patient database is therefore warranted.

Conflict of Interest (only if applicable):
M.L.G. is a shareholder in R2 Technology, Inc. (Sunnyvale, CA).